The Survivor Dividend as a Tool to Improve Pension Adequacy in Nonfinancial Defined Contribution Pension Schemes

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Table of contents

Table of contents

Table of contents

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- Defined Contribution (DC): Pension depends on the accumulated capital.

What is a NDC pension scheme?

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$\rightarrow$ NDCs attempt to reproduce the logic of a financial defined contribution pension plan within a pay-as-you-go framework.

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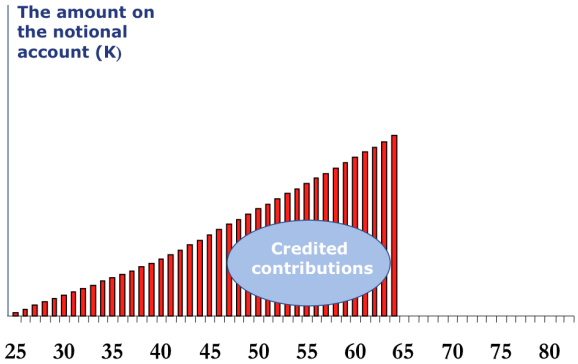

Figure: Principle of NDCs

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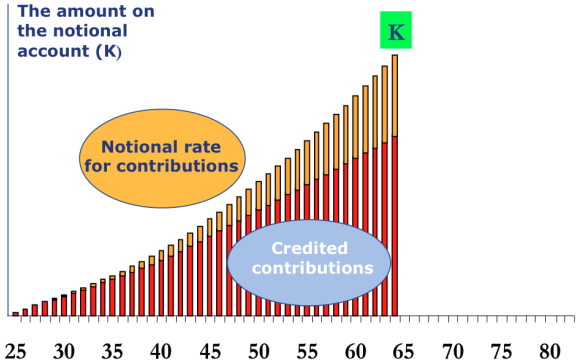

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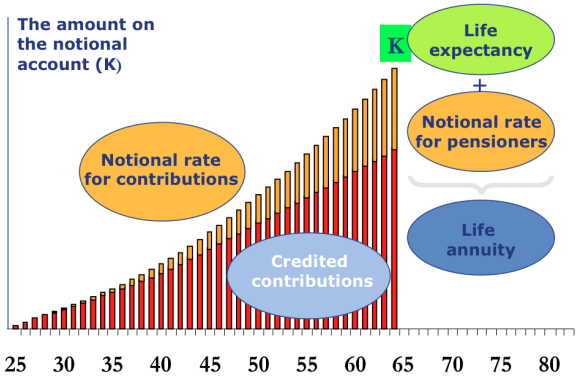

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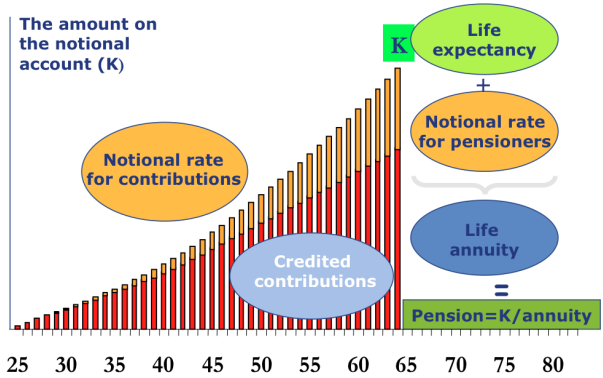

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Table of contents

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  $\rightarrow$ Survivor Dividend (or inheritance gains, Boado-Penas and Vidal-Meliá [2014]).
  $\rightarrow$ Does not take into account social justice or pension adequacy.

How can we use the survivor dividend?

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- Distribute it to the survivors, as in Sweden.
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- Accumulate some financial reserves for other purposes.
  $\rightarrow$ Can we use it to finance a minimum pension?

Table of contents

Aims

1. To determine how the survivor dividend should be distributed among the survivors for the system to be at equilibrium.

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2. To determine if the amount of the survivor dividend is sufficiently large to guarantee a minimum pension to the lowest socio-economic classes $\rightarrow$ minimum standard of living for the pensioners.

Table of contents

Table of contents

How should the survivor dividend (SD) be distributed among the survivors for the system to be at equilibrium?

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- When considering unisex mortality
  $\rightarrow$ The system cannot be at equilibrium if we keep a contribution rate constant across socio-economic groups.

Table of contents

Conclusion 1

For the system to be at equilibrium with an equal contribution rate across socio-economic groups, we need to compute pensions using socio-economic mortality rates and distribute the SD.

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However, in practice, unisex mortality tables are used to determine the amount of the pension.
$\rightarrow$ The system will never be at equilibrium!

Table of contents

Table of contents

Expenditure if the survivor dividend IS NOT distributed and socio-economic mortality differences ARE NOT considered

$$E_t^{nd} = \sum_i \left[P^{i,nd}_{(x_e+A,t)} \cdot l^i_{x_e+A} \cdot \ddot{a}^{\lambda,i}_{x_e+A} \right]$$

where

- x_e is the entry age in the system;
- A is the number of years during which contributions are paid and thus $x_e + A$ represents the retirement age;
- $P^{i,nd}_{(x_e+A,t)}$ is the initial pension at time t for an individual age $x_e + A$, belonging to the socio-economic category (SEC) i, when the survivor dividend and SEC mortality are not taken into account;
- l^i_x is the number of individuals alive at age x, belonging to SEC i;
- $\ddot{a}^{\lambda,i}_x = \sum_{k=0}^{\infty} \left\{(1+\lambda)/(1+g)\right\}^k \cdot {}_k p^i_x$ is a whole life annuity-due indexed at rate λ, with an interest rate g, for an individual age x and belonging to SEC i.

Table of contents

Expenditure if the survivor dividend IS distributed and socio-economic mortality differences ARE considered

$$E_t = \sum_i \left[P^{ii}_{(x_e+A,t)} \cdot l^i_{x_e+A} \cdot \ddot{a}^{\lambda,i}_{x_e+A} \right]$$

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$\rightarrow$ Which minimum pension can it finance?

Table of contents

Assumptions

- Entry age = 25;
- Retirement age = 65;
- Contribution rate = 16%;
- Baseline case:
  growth rate of salaries = pension indexation = 0;
- French data for annual salaries and mortality rates per different level of educational attainment.

Data

Group	Annual salary	% female population	% male population
Higher diploma	€26,328	9.77	9.01
Bachelor+	€21,600	8.33	6.35
CAP/BEP	€17,850	20.76	23.35
College certificate	€16,896	3.73	3.48
No diploma	€15,600	8.25	6.97

Table: French annual salary by level of educational attainment

Results

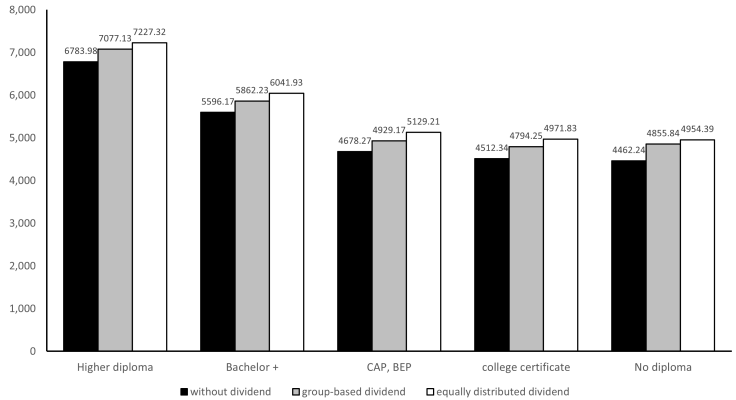

Figure: Annual pension for females considering female mortality per level of educational attainment

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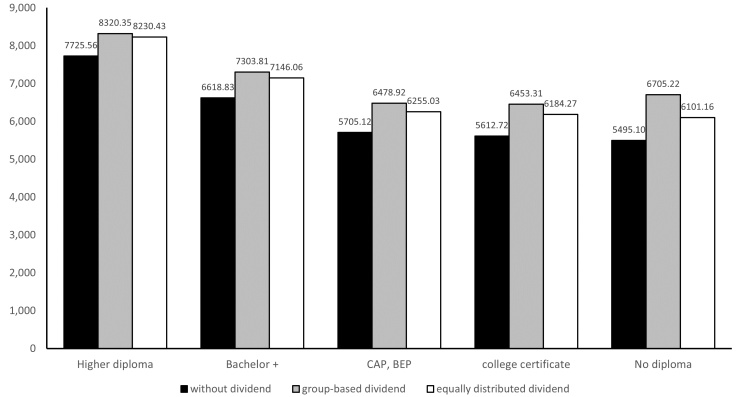

Figure: Annual pension for males considering male mortality per level of educational attainment

Can we guarantee a minimum pension to the lowest socio-economic classes by using the survivor dividend?

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→ Women in the lowest socio-economic group would receive an increase of **27%**.

Table of contents

Conclusion 2

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→ These reserves can be used to finance a minimum pension that can benefit a significant proportion of the population!

Bibliography

S. Arnold, M.C. Boado-Penas, and H. Godinez-Olivares. Longevity Risk in Notional Defined Contribution Pension Schemes: a Solution. *The Geneva Papers on Risk and Insurance - Issues and Practice*, 41(1):24–52, 2016.

M.C. Boado-Penas and C. Vidal-Meliá. Nonfinancial defined contribution pension schemes: is a survivor dividend necessary to make the system balanced? *Applied Economics Letters*, 21(4):242–247, 2014.

Thank you

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